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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/500,809

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Yulun Li

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6988

26530

7590

08/28/2006

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EXAMINER

AWAI, ALEXANDRA F

ART UNIT

PAPER NUMBER

3663

DATE MAILED: 08/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/500,809

Applicant(s)

LI ET AL.

Examiner

Alexandra Awai

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 30 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments filed 6/30/2006 have been fully considered but they are not persuasive. Those rejections or objections that have been overcome or rendered moot by amendment are omitted from the present Office Action and are considered withdrawn. Examiner regrets any confusion regarding the drawings, and notes that the incorrect set of priority document drawings was listed as the relevant drawing set in the Patent Office database when the papers were filed on 9/14/2004. However, it is clear from the original disclosure that the most recently submitted set of corrected drawings is the one that correctly corresponds with the written specification. In the present case, the accidental substitution of the incorrect drawings does not influence Examiner's consideration of the case as the specification provides a more detailed description than either set of drawings, and is therefore heavily relied upon. The rejections resulting from this careful consideration are based upon unambiguous disclosures in the prior art.

There appear to be inconsistencies between Applicant's Remarks and the most recent set of claims. Applicant states that claim 5 has been amended to recite "the residual heat cooler is comprised of an electromagnetic valve on a connection tube" (Remarks, p. 11). However, claim 5 actually recites the following:

"The low-temperature and low-pressure NPP spent fuel reactor according to claim 1, wherein a cooler is provided in the spent fuel storage pond and an electromagnetic valve is arranged on the connection tube to form a passive residual heat removal system."

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This amendment was apparently made to overcome the rejection under 35 U.S.C. 112 that the claim fails to set forth the components that comprise the residual heat removal system and manner in which they are configured. However, it is not clear that the “cooler” recited in the claim is the same as the “residual heat cooler” mentioned in the Remarks, or how it is related to the “passive residual heat removal system.” The claim currently seems to communicate that the nuclear power plant comprises a passive residual heat removal system embodied by an electromagnetic valve arranged on some connection tube *in addition to* the cooler located in the spent fuel pond. Examiner notes that Applicant has failed to provide any pointed arguments directed to the rejection of claim 5 under 35 U.S.C. 103.

Similarly, Applicant states that claim 1 has been further amended to recite “an underwater **hole canal**” (Applicant’s emphasis). However, claim 1 actually recites an underwater handling canal. Applicant goes on to argue that this special and novel underwater fuel-handling canal replaces conventional fuel handling systems and forms the basis for Applicant’s belief that claim 1 is patentable over the prior art. However, although Examiner rejected a similar “underwater handling canal” feature in section 15 of the Office Action dated 1/4/2006, Applicant failed to argue the issue, focusing instead on currently removed coolant recitations of claim 1. The only portions of Applicant’s written disclosure devoted specifically to the handling canal consist of the following:

“Within the core pool there is an underwater handling canal, which is connected with a spent fuel storage pond and an additional schema of reloading water layer is replaced by the under water handling canal” (page 3),

“reference numeral 14. identifies a handling canal” (page 6),

“On the side of the core pool (8) there is provided an underwater handling canal (14), which is connected with the spent fuel storage pool (15) and is plugged with a sealing

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plug when the reactor is in operation to ensure the core pond (8) is isolated from the spent fuel storage pond 15” (page 6), and

“The canal (14) is open in case of handling to transport the spent fuel assemblies” (page 6).

No mention of the conventional fuel handling systems that the allegedly novel handling canal replaces is made in the Background of the Invention, which instead focuses on the issue of optimally using spent fuel in a low-temperature, low-pressure core for such purposes as heating and desalination. Applicant provides no guidance as to how a skilled artisan would make the canal and plug, or how to operate the plug and use the canal to handle the spent fuel.

Accordingly, if the handling canal were novel, one of ordinary skill in the art would not know what parameters or materials to use in manufacturing the canal and plug, how this plug submerged in radioactive coolant is removed or replaced, or how the spent fuel submerged in radioactive coolant is maneuvered through the unplugged canal.

With regard to claim 2, Applicant argues that “the airtight shield of claim 2 is arranged at the top of the core pool in an area between the sealing over and the airtight shield and is subjected to negative pressure” (Remarks, p. 12). Claim 2 in fact recites that there may be either one of a sealing cover and an airtight gas shield, and makes no mention of subjecting the area between these structures to a negative pressure. Furthermore, in view of Fig. 1, it appears that the claimed feature might be more accurately described by reciting that either the sealing cover or gas shield is positioned above the core pool and pressure vessel, as opposed to provided on top of the core pool.

Claim 3 was previously amended to recite a pressurizer or large pool connected with the coolant inlet nozzle to control static pressure and maintain pressure at the core outlet. Applicant

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argues that Examiner's contention that such is conventional should be supported by a reference. The recitation of this feature is clearly based upon an amendment to page 3 of the specification that communicates information from the original abstract. The original specification simply mentions that there is a pressurizer connected to the core inlet and that it is at a higher elevation "to form core outlet pressure." Just as in the case of the handling canal, Applicant has failed to provide the guidance that would have been necessary for enabling the disclosed pressurizer if it were actually novel. Indeed, the absence of such guidance is a tacit admission that Applicant is fully aware that they are not the inventors of the pressurizer as generally disclosed in their application. As requested, a reference has been cited to demonstrate that pressurized water reactors comprise pressurizers as claimed. Additionally, a NRC manual for PWR systems has been made of record to demonstrate how essential pressurizers are to conventional PWR systems.

### *Status of the Claims*

2. Amended claims 1-3 and 5 have been examined; claim 4 having been canceled by Applicant.

### *Claim Rejections - 35 USC § 112*

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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4. Claims 1-3 and 5 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure which is not enabling. Elements critical or essential to the practice of the invention, but not included in the claims are not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976). As discussed in section 1 of this Office Action, Applicant provides no guidance as to how a skilled artisan would make the canal and plug, or how to operate the plug and use the canal to handle the spent fuel. Accordingly, if the handling canal were novel, one of ordinary skill in the art would not know what parameters or materials to use in manufacturing the canal and plug, how this plug submerged in radioactive coolant is removed or replaced, or how the spent fuel submerged in radioactive coolant is maneuvered through the unplugged canal. Similarly, Applicant has failed to provide the guidance that would have been necessary for enabling the disclosed pressurizer. If Applicant is arguing that the pressurizer is not conventional, then Applicant's specification is not enabling.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-3 and 5 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Because the claims are not enabled as discussed above, they are also indefinite. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. As discussed in section 1 of this Office Action, the components that embody "a cooler" recited in claim 5 are not recited. There is insufficient antecedent basis for "the connection tube" in claim 5.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Greul (DE 3718510A), and further in view of Fermi et al. (2,714,577) and Jones (3,883,012).

Greul discloses a reactor that operates at low temperature and utilizes spent fuel, such as that from a light water reactor (see English language abstract). The Greul invention clearly draws upon CANada Deuterium Uranium (CANDU®) technology, which is commonly understood within the relevant art, as the CANDU® reactor was designed in the 1960's. The CANDU® reactor type operates at relatively low temperature and utilizes *pressurized* coolant as well as *unenriched* uranium oxide or mixed oxide fuel (i.e. spent fuel). It is conventional in the art for a nuclear reactor to comprise a fuel assembly, upper and lower core grid plates, control rods and



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their drive mechanisms, a core within a core vessel, and coolant inlet and outlet nozzles. These components were present in some form in the Fermi/Szilárd Neutronic Reactor, patented in 1955 (2,714,577). Fermi et al. gives evidence proving the conventionality, and in most cases, the *necessity* of the listed components in the typical nuclear reactor. It is therefore inherent to the Greul invention, and to various CANDU®-type reactors, that they may be constructed as set forth by the applicant in claim 1. As to limitations which are considered to be inherent in a reference, note the case law of *In re Ludtke*, 169 U.S.P.Q. 563; *In re Swinehart*, 169 U.S.P.Q. 226; *In re Fitzgerald*, 205 U.S.P.Q. 594; *In re Best et al*, 195 U.S.P.Q. 430; and *In re Brown*, 173 U.S.P.Q. 685, 688.

Greul and Fermi et al. fail to explicitly teach the presence of an underwater handling canal as set forth in presently amended claim 1. However, Jones discloses a system wherein a spent fuel pool (13) is connected to the core pool (14) by a canal (8). This canal may be closed off by movable doors (9), which read on the claimed sealing plug. That is, the doors may plug the canal while the reactor is in operation and open when the handling of spent fuel assemblies is required. Using a canal as disclosed by Jones in the system disclosed by the Greul and Fermi et al. would provide a simple means for handling spent fuel, and is no more than the advantageous application of a well known expedient in the art. The motivation for employing the canal would be to permit the transfer of nuclear fuel assemblies while only utilizing widely available technology and materials.

10. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Greul, Fermi et al. and Jones as applied to claim 1, and further in view of Costes (5,075,070).

Greul, Fermi et al. and Jones do not explicitly teach the use of a sealing cover or airtight shield as a gas shield for a core pool. Costes disclose employing a concrete enclosure (2) within a domed containment. As best seen from Fig. 1a, both of these structures are provided above the pool (20). It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to implement Costes's concrete enclosure and/or domed containment in order to prevent leakage of radioactive or otherwise harmful gases from the core pool of the reactor type disclosed by Greul. Such would amount to no more than the use of an established technology for the purpose of increasing safety.

11. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Greul, Fermi et al. and Jones as applied to claim 1, and further in view of Baum (4,632,705).

The primary references do not explicitly state that the pressurized coolant of Greul et al. is pressurized with a pressurizer connected with the coolant inlet to maintain pressure at the core outlet. However, Baum teaches that a pressurizer (9) may be employed in the coolant loop just for this purpose. Because the entire coolant loop and its associated components are fluidly connected, the pressurizer and inlet nozzle are connected, just as in the present invention. The motivation to use a pressurizer in a PWR is to pressurize the coolant so that it does not boil. The use of this instrument would be obvious to one of ordinary skill in the art, as pressurizers are known to be useful in pressurized water reactors.

12. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Greul, Fermi et al. and Jones as applied to claim 1, and further in view of Newton et al. (5,268,942) and Dickson (3,309,278).

Greul, Fermi et al. and Jones do not teach the use of a passive residual heat removal system that is coupled to a spent fuel pool, as is claimed in the present invention. However, Newton et al. disclose a spent fuel pool cooling system comprising a residual heat removal system and a spent fuel pool (Abstract). Dickson discloses a solenoid-driven valve (column 4, line 2) that is opened during a loss of power event. It would have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the fluid connections of the Newton et al. invention to operate by an electromagnetic mechanism, as in the Dickson invention, and to incorporate the resulting passive heat removal system into the reactor disclosed by Greul. Furthermore, passive heat removal systems fluidly connected to core pools or spent fuel pools are conventional within the art, and they typically comprise tubes and valves – electromagnetic valves having been used since the 1960's, as shown by Dickson.

### *Conclusion*

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexandra Awai whose telephone number is (571) 272-3079. The examiner can normally be reached on 9:30-6:00 Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AA

August 21, 2006

  
JACK KEITH  
SUPERVISORY PATENT EXAMINER